PHYSIOLOGY AND ANATOMY FOR NURSES

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INTRODUCTION.

To one who stands outside the profession of nursing, and who is accustomed to regard as a matter of course the methods of instruction which exist in all first-class educational institutions, the conditions prevailing in most of our training-schools for nurses cannot but provoke a feeling of surprise. That the training-school for nurses should be some decades behind the other professional and industrial schools is a fact which, however much we may regret it, is hardly to be wondered at. I do not, however, purpose to discuss the causes of this backwardness, for here, as elsewhere, it behooves those of us who are interested in the subject to act rather than to criticise, or, if asked to write, to do this with the object of calling attention, not to what might be done, but to what has been done, and hence can be done, to improve the present conditions.

It will soon be evident to many of my readers that this communication contains not one single new idea. They will find in it, on the one hand, merely another * recognition of the fact that the training-school for nurses is essentially like any other school, that its pupils are essentially like other pupils, and that, therefore, the same general methods of instruction should be employed as in the training of the archæologist, the physician, or the mechanical engineer. On the other hand, they will find in it (and this is its *raison d'être*) that the seed of this recognition has been planted in the small field of "anatomy and physiology for nurses" and that it has borne fruit, and they will be put in a position to judge of this fruit whether it be good or bad.

The following pages, then, contain a description of the methods which have been employed in the teaching of physiology and anatomy, and a statement of the results of several years' experiment and experience in this work in the Johns Hopkins Training-School for Nurses.

PROBATION AND PRELIMINARY TRAINING.

The question of the preliminary training of nurses has already been ably discussed in the pages of this journal.† It seems to be the

* R. C. Cabot, Boston Medical and Surgical Journal, Vol. CXLV., 1901, p. 567; this journal, Vol. II., 1902, p. 656.

† M. A. Nutting, this journal, Vol. I., 1901, p. 416.

opinion generally held by those conversant with nursing problems that the standards of admission to our training-schools are too low. It is said that before the pupil enters the hospital she should have had a course in domestic economy and the elementary medical sciences. Be this as it may, the facts remain that there are few cities in this country where such courses are offered,* and that, moreover, the number of desirable applicants is so small that it seems impossible, for the present at least, to demand a better preparation.

On the whole, the plan adopted at the Johns Hopkins Hospital is perhaps the most satisfactory. As is now well known, this school gives its own preliminary training,† a six-months' course in domestic economy and certain medical sciences, and it is only after the satisfactory completion of this course that the probationers don the cap and apron and are admitted into the wards as pupil nurses. Under the term "medical sciences" are included materia medica, hygiene, anatomy, and physiology, and it is to a consideration of the last two subjects that I will confine myself.

PHYSIOLOGY AND ANATOMY, GENERAL STATEMENT.

The duration of the course in physiology and anatomy is about eleven weeks. It is given twice a year; in the autumn to the probationers admitted in August, and in the spring to those admitted in February. There are from twenty to twenty-five probationers in each class. The instructors are three in number, a graduate nurse, a pupil nurse, and a member of the Medical School staff.

According to its character the class-work may be divided as follows:

1. Class-room exercises, twice a week, two to four P.M.
2. Class-room exercises, twice a week, eight to nine P.M.
3. Laboratory exercises, once a week, two to five P.M.

AFTERNOON RECITATIONS.

On two afternoons a week the probationers meet the graduate nurse for recitations on subjects previously assigned. Each pupil is provided

* Is it not probable that if institutions offering such courses should become more numerous, the courses would be of very unequal value, so that unless special preliminary schools were affiliated with certain hospitals, it would be necessary for every superintendent to discriminate between preparatory schools which were of good standing and those which were not, and to recognize those which gave satisfactory training in certain subjects but were deficient in others?

† M. A. Nutting, this journal, Vol. II., 1902, p. 799.

with a copy of Kimber's "Anatomy and Physiology for Nurses," * and the recitations are based chiefly on this text-book. The nurses' library also contains several larger reference-books, such as "The American Text-book of Physiology" and the anatomical text-books of Gray and Morris. A small book which is frequently read with profit is Huxley's "Elementary Physiology.† From time to time the pupils are required to spend a part of the recitation period in writing short papers on some stated topic. These papers are then read and criticised before the class. It is purposed to make this writing of papers a much more frequent and important exercise.

These recitations give the pupils some preliminary knowledge of the subject, so that they come to my evening classes prepared either for a supplementary lecture or for a recitation which often differs widely in character from that of the preceding afternoon. In the evening recitations they are required not so much to repeat what they have learned, as to arrange and rearrange the facts, to draw comparisons, to analyze, and to make deductions.

The graduate nurses who have thus far conducted the afternoon classes have in no case been thoroughly trained in anatomy and physiology. Nevertheless, they have been given special advantages in the way of attending lectures and demonstrations in the Medical School, and have been relieved as far as possible from the interruptions and responsibilities of ward duty.

The importance of having a good teacher in this position cannot be overestimated. There is to my knowledge no suitable text-book which approaches the subject from a truly scientific stand-point. They are descriptive, not logical. Hence the course must take its tone entirely from the instructor. Nor is it merely the teaching of a few facts in anatomy and physiology that is required, for it is often necessary to make a careful study of the class to detect the presence of dormant mental faculties and to direct and develop them. ‡

* Diana C. Kimber, "Text-Book of Anatomy and Physiology for Nurses," the Macmillan Co., New York, 1902 (2d edition).

† T. H. Huxley, "Lessons in Elementary Physiology," edited by F. S. Lee, the Macmillan Co., 1900.

‡ This last statement may lead to the question, Is the preliminary course to be a sort of kindergarten for grown-up children? The reply is that for the present at least this must often be the case. Suppose, for instance, we require twenty nurses. We admit twenty-five of the most promising applicants. Of these fifteen are intelligent but ten are not, or at least only potentially so. We send away five, and there remain on our hands five Bœotians. These we must carry for the next three years like Old Men of the Sea unless some shrewd and experienced teacher can recover them from their intellectual cretinism by the proper remedies.

It goes without saying that teachers of this kind are rare in training-schools, but they are very essential, for that which constitutes a training-school is practically the same as that which constitutes a State, it is not equipment nor organization, it is women.

EVENING EXERCISES.

On two evenings of the week the instructor from the Medical School meets the class for an informal recitation or a lecture or both combined. Here the pupils are given abundance of opportunity for asking questions and of having confusing points cleared up. To know only anatomy is to know only the alphabet of a strange tongue. No one appreciates this fact more than the anatomist. Structure must ever be subsidiary to function or development. It has therefore been the principle adopted in this course to place function first and to require of the pupils only such anatomical knowledge as is distinctly useful for the proper appreciation of the workings of the various physiological processes.

A constant effort is made to place facts in their proper mutual relations and to present the various topics in their logical sequence. Hence the first lectures deal with our fundamental conceptions of matter and energy, the properties of matter in general, then those of a particular kind of matter, namely, protoplasm, as illustrated in one of the simplest of living forms, the amœba. This is followed by a discussion of the cell, the cell doctrine, and the theory of descent. From the amœba we pass on to the study of the properties of protoplasm as seen in the more highly differentiated cells, the muscle-fibre and the neurone. Then come the anatomical groupings of the muscle-cells in man (the musculature), together with the rigid parts to which the muscles are attached (the skeleton), and next the anatomical grouping of the neurones (the nervous system). The knowledge of the relation of nerves and muscles together with a few of the physical properties of liquids and of elastic substances forms the basis of our study of the circulation. This same nerve-muscle physiology along with some of the physical properties of gases gives the key to the mechanics of the respiration. Having studied these three vital properties, namely, contractility, conductivity, and irritability, we now discuss another, namely, secretion. On secretion and the action of enzymes depend all the phenomena of digestion. Assimilation is a fifth property of protoplasm, and in connection with this we study the respiratory exchanges, the absorption, use, and fate of the various food-stuffs, the in-take and out-put of material and energy, or, in other words, metabolism.

Physiology occupies a position midway between biology and medi-

cine. A knowledge of its relation to the latter is of especial importance to the nurse, as to the physician. Therefore, while the biological point of view is emphasized chiefly in the lectures, the practical side is not neglected, but is especially dwelt upon in the recitations. This point may be illustrated by such questions as the following: Do the lungs collapse when the diaphragm is punctured? Who is the "Sand-Man"? Where can the pulse be felt? Why do we become sleepy after meals? What is a blush? Why do we massage tired muscles and suture severed nerves? What is the importance of the psychical condition during digestion?

LABORATORY WORK.

At present no one, I think, doubts that it is impossible to teach anatomy without dissections or physiology without demonstrations. Moreover, it is well known that persons who are able to read are prone to see nothing which is not printed. Hence a laboratory course not only gives the pupils an opportunity of seeing and handling the organs and tissues, the real things themselves, but cultivates their powers of observation.

This practical work is under the direction of the graduate nurse, who is assisted by a pupil nurse from the senior class. The latter is selected for her proficiency in the subject and is given two afternoons a week in order to prepare for these exercises, which are held in one of the large laboratories in the Medical School.

Each nurse is required to study and make a rough dissection of the following viscera: the heart, lungs, and larynx, the alimentary tract, including the liver and pancreas, the spleen, kidney, and eye. This material is obtained at slight expense from the slaughter-house. Since dogs and cats are frequently used in the Medical School for physiological experiments, it has been found possible to obtain these animals when dead for the use of the probationers. Whenever such material is available, two of the nurses are asked to dissect out some special part for demonstration to the class. The larger arteries, the sympathetic chain, the sciatic and vagus nerves, the brachial plexus, and the like are demonstrated in this way, while the more difficult procedure of exposing the brain and cord and demonstrating the membranes, the spinal nerves, their roots and ganglia, is usually performed by the graduate nurse.

A few physiological demonstrations are also given, such as the following: the contraction of a frog's muscle on stimulation of its nerve, the hæmolysis of blood, the oxidation and reduction of hæmoglobin, the beating of the turtle's heart in situ and after excision, the inhibitory action of the vagus nerve on the turtle's heart, and so forth.

Moreover, there are a few microscopical demonstrations of teased tissues, of blood, of cells of various types, of the action of cilia, and of the circulation in the frog's web.

Models of the eye, ear, and brain belonging to the Medical School are also available on these occasions. For the convenience of the pupils a mounted skeleton and a number of loose bones are kept in the class-room of the Nurses' Home.

COMPETITION AND EXAMINATIONS.

Wherever there is competition for prizes there is the laborious and often unsatisfactory task of grading the pupils according to their proficiency. In the case of the probationers the prize is "seniority." From time to time vacancies, temporary or permanent, occur in the ranks of the upper classes in the Training-School and it falls to the lot of the pupils of the next lower class to fill up such vacancies in the order of their "standing," or, to use the more common but misleading term, their "seniority." A junior is always a junior, but among juniors the nurse who has the highest "standing" is the first to be entrusted with the duties and responsibilities which her class may fall heir to by the withdrawal of someone from the next class above. The "senior," then, or better, the "dux," of the junior class is the nurse who has made during her probation the highest average in physiology, anatomy, hygiene, materia medica, dietetics, practical cookery, general house-work, and so forth.

The value of this so-called "promotion by merit" is, of course, dependent on the perfection of the system employed in marking. Frequent conferences between the instructors in physiology and anatomy enables us, we think, to form a fairly just estimate of the relative merits of the probationers, and at the end of the course each pupil is given a "recitation mark," which has the same weight as the result of a final written examination which is held at the end of the course.

It is to be borne in mind that many written examinations are purely memory tests and give the examiner but little information regarding the true mental capacity of the pupil. A good examination-paper is not one which contains a large assortment of unconnected details, but a clear, concise, and logical presentation of the salient features of some large subject. A paper of this character shows that the pupil has thought over and digested the topic under consideration. It is the opinion of the writer that the true mental calibre of the pupil is best discovered by asking a few questions of a general or indefinite character, by requiring short answers, and by giving the pupils a long time in which to formulate them. By general questions are meant such as the

following: Describe the head; describe the anatomy and physiology of the nervous system; discuss the subject of enzymes.

VALUE OF THE COURSE.

We have described the course which is now being given in the Johns Hopkins Training-School, and which has been in process of evolution for the last three years. A course of this kind entails a great amount of labor and considerable expense, and the question arises, is it worth while?

At first sight this looks like a single question, but on closer inspection it resolves itself into two. The first question is, What do the nurses get out of such a course? and the second, Is the gain to them as nurses worth the time and money expended? Since the general impression of the instructor who states that his pupils are profiting by his instruction is worthless, the method which I will adopt in answering the first question is to publish the class statistics along with three sample examination papers:

Questions.

1. What is shock, how do we treat it, and why?
2. Discuss the subject of reflex action and the relation of reflex to voluntary action.

No. 14.

Shock. Shock is a condition of the system in which the blood does not fill the vessels, and hence cannot circulate properly because the heart pumps itself empty and there is not blood enough ahead to

Kinds. be forced back into it. Shock is of two kinds, hæmorrhagic and nervous. Hemorrhagic results from loss of blood and nervous shock from paralysis of the vasoconstrictors, resulting in a dilation of the vessels. They really amount to the same thing, namely, not enough blood for the size of the vessels, and the treatment is much alike.

Treatment. In hemorrhagic shock infusions are given, sometimes also in nervous shock. This is to increase the amount of fluid in the vessels so that they may be more nearly filled and thus the circulation complete. The infusion should be a saline solution of the same osmotic pressure as the blood. In both cases the foot of the bed is raised to prevent anæmia of the brain. The limbs are sometimes tightly bound to prevent so large an amount of blood from flowing to them. In nervous shock, if the constrictors can be stimulated or if the dilators cease to be stimulated, the arteries become smaller.

Reflexes. Reflex action is the simplest form of nervous activity. For reflex action two neurones are necessary, a motor and a sensory neurone, also a nervous centre. The nervous centre may be the brain, spinal cord, or a ganglion. A stimulus applied to the peripheral end of a sensory fibre is carried along that fibre to the

cell-body, then to the nervous centre by the sensory dendrone, acting as an axone. In the nervous centre it is transmitted to the motor neuron and passes by the motor dendron, cell-body, and axon to the periphery, causing a contraction of a muscle if it ends in a muscle or the stimulation of a gland if it ends in one. The action depends on the sensory nerve stimulated and the peripheral ending of the motor nerve.

Examples. "Mouth-watering" is an example of a reflex. When food is taken into the mouth the sensory nerves are stimulated, the impulse carried to the nervous centre, and an impulse sent back over the nerves controlling the salivary glands. The action of these is increased, causing an increased flow of saliva into the mouth. This is a chemical stimulus. A psychical stimulus may be caused by the sight of food. In this the optic is the sensory nerve stimulated. Along this the impulse is sent and is returned by the same motor nerves as before, those controlling the action of the salivary glands.

Relation to Voluntary Action. All our actions are really reflexes, even voluntary actions, for if they are analyzed a reflex arc can be traced out. For example, the sight of a book makes us think of that book or of some other, and we voluntarily walk to the table to get it. Some reflexes are very complex, while others are simple. Things that we do over and over become simple reflexes, so that we do things that were once difficult without thinking about them. Such reflexes have a lower centre than the brain, but actions involving thought have the brain for their centre.

Questions.

1. Describe the anatomy and physiology of the heart.
2. Describe the organs and process of respiration.
3. Discuss the subject of reflexes.

No. 11.

1. The heart is a muscular organ situated in the thorax, the base, or larger part, projecting upward and to the right and the apex downward and to the left. It has a muscular and serous coat. The outside coat is called the pericardium and the inside lining the endocardium. The heart is divided into a right and left side, and then also divided transversely into an upper and lower half, the upper part being called the auricles, the lower the ventricles. Four veins, the pulmonary veins, come from the lungs to the left auricle, the blood leaving the left ventricle by the largest artery of all, the aorta. The blood after travelling through the body comes back to the heart by the superior and inferior vena cava to the right auricle, passing out of the right ventricle by the pulmonary artery to the lungs. This is the only case when a vein carries red blood and an artery blue blood. The right and left side of the heart contain two sets of valves—the mitral, between the left auricle and left ventricle, and tricuspid, between the right auricle and right ventricle. The semilunar valves are also in the aorta. All these valves are placed in such a way as to allow the blood to go out, but they close up if the blood should be pressed back in the opposite direction. The heart has also an abundant nerve-supply. The muscle in the heart is different from all

other muscles inasmuch as it is striated and yet involuntary. It has two sets of nerves, the inhibitory, which slow the action of the heart, and the accelerators, which quicken its action. The systole is the contraction of the heart and diastole the dilation. The different murmurs of the heart when too great are called râles. There is a long sound, then a short one, and a pause. The time between the first and second sound is too short to be counted, but between the last sound and the first one again is a little pause. The blood comes from the lungs rich in oxygen by way of the four pulmonary veins, enters the left auricle, passes through the mitral valve to the left ventricle, shoots up through the aorta, and is distributed to all parts of the body. As it reaches the capillaries in the extremities by osmosis it goes into the capillaries of the veins, where it is blue blood, having lost its oxygen and being full of carbonic acid. It then goes by the superior and inferior cava to the right auricle, through the tricuspid valves to the right ventricle, up through the pulmonary artery to the lungs.

2. The organs of respiration consist of the larynx, trachea, and lungs. The larynx is situated in the back of the mouth, is irregular in shape, the broader end, though, being at the top. It consists of strong pieces of cartilage. In either side are two muscular flaps called vocal cords. The larynx joins the trachea. The trachea is about three and one-half inches long and is composed of bands of cartilage. The cartilaginous bands are crescent-shaped, so as to leave a soft surface where it comes in contact with the œsophagus, which lies just back of the trachea. The trachea branches off into the bronchial tubes, which enter either side of the lungs, branching into smaller and smaller branchioles as it goes farther and farther into the lungs. They lose their cartilaginous bands altogether, just leaving one layer of epithelial tissue. These little epithelial sacs are called alveoli. The lungs are pink, spongy-looking organs, occupying nearly the whole of the thorax. The right side is larger and broader than the left. It is a little shorter by one inch than the left, where it allows for the right lobe of the liver. There are two sides of the lungs, the left being divided into three lobes and the right into two. The lungs are covered by a serous membrane, the pleura. This forms a double layer, one layer adhering very closely to the chest-wall and the other to the lungs themselves. At birth the lungs are perfectly flat. On drawing air into the lungs the diaphragm contracts, also the intercostal muscles, causing the thoracic cavity to increase very much in size. The lungs swell out and fill the cavity. This is called inspiration. The muscles then simply relax, and the pressure on the inside of the lungs being greater than on the outside the air rushes out again. The lungs are never fully emptied. Respiration is caused by the venosity of the blood and the nerve-centre in the medulla. The air we breathe in is full of oxygen and the tissue between the little alveoli and the blood-vessels in the lungs is so thin that by osmosis the oxygen gets into the blood, is distributed all through the body, and by this same procedure the body rids itself of carbonic acid.

3. A reflex is a sensation coming in from the periphery by the afferent, or sensory, nerve, passing into the cord, and returning by the efferent, or motor, nerve. If the periphery be very highly stimulated and we become conscious of it, the impulse is sent in by the afferent to the cord, and up the cord to the brain and back again by the efferent, or motor, nerve. If we are not conscious of it and the periphery be stimulated, it, the impulse, simply goes through the spinal ganglia to the dorsal root, from there to the ventral, or motor, root, and out by the afferent, or motor, nerve. There is also a psychic reflex. If we see anything and know it is good to eat, our mouth waters for it, causing a reflex secretion.

Questions.

The same as in the preceding, except that in place of 2 the following question was substituted: 2. Discuss the subject of enzymes.

No. 17.

1. The heart is the centre of the circulation and is a hollow, muscular organ situated in the upper part of the thoracic cavity between the lungs, a little to the left, with the apex pointing downward and out; it lies behind the sternum and is supported by the diaphragm. It is cone-shaped and is about the size of the fist of its owner.

It is longitudinally traversed by a thick partition into a right and left side, having no communication with each other. Each side is subdivided into an auricle and ventricle, which connect by means of constricted openings known as the auricular-ventricular openings. These openings are provided with valves; that in the right, having three flaps, is called the tricuspid, in the left the bicuspid. These valves are so constructed that the blood after leaving the auricle cannot be forced back. The broad edges are attached at the auricle with the pointed ends into the ventricles and held by little, muscular pillars, the chordæ tendineæ. The walls of the ventricles are much thicker than those of the auricles and the left side much stronger and thicker than the right because of the greater amount of work required of it. The right side of the heart contains venous and the left side arterial blood. The inferior and superior venæ cava bring the impure blood to the right auricle, whose walls contract, sending the blood through the auricular-ventricular opening into the right ventricle, and the chordæ tendineæ contract, closing the tricuspid valve. By the contraction of the walls of the ventricle the blood is forced through the semilunar valve, which is arranged in the form of pockets, into the pulmonary artery, through which it is carried to the lungs, where it reaches the capillaries and the hæmoglobin becomes oxyhæmoglobin. As such it is brought back to the left ventricle through the pulmonary veins. The walls of the auricle contract, and the blood is forced through the semilunar valves of the aorta, circulating through the system, giving to the tissues oxyhæmoglobin through the capillaries, they again taking up carbon dioxide, which again makes the circuit. The substance of the heart is supplied with blood through the coronary veins. The heart is automatic, beating rhythmically, the nerve-supply is from the sympathetic system, the cardiac inhibitors slow the action, and the accelerators increase the action. The vasodilators and the vasoconstrictors regulate the blood-vessels.

2. During the process of digestion the food is acted upon by enzymes. The principles of food are divided into proteids, which are nitrogenous, carbohydrates (non-nitrogenous), and fats.

In the mouth the carbohydrates are acted on by ptyalin, changing it to dextrine. In the stomach there is very little change. In the small intestine it is acted on by the amylopsin, changing it to glucose; being soluble, it is then absorbed through the portal vein to the liver and stored as glycogen insoluble, and then passes out as glucose soluble.

Proteids are acted upon in the stomach in an acid medium, hydrochloric acid, by pepsin, changing them to peptones; in the duodenum, which is alkaline, they are acted upon by trypsin; in the liver, by ammonia bodies, forming urea. Fats are broken up in the stomach and carried to the duodenum, and as fats and glycerine acted upon by steapsin, some carried off as waste, some forming fatty tissue.

Only a brief comment is required by these three papers. In the first place, the "marks" given were ninety-seven per cent., eighty per cent., and fifty-nine per cent., respectively. No. 14 is, on the whole, excellent, and the errors are unimportant. Two or three papers of this character are handed in yearly. In No. 17 it will be seen that the pupil misinterpreted the second question and left out the third question altogether. This is one of the best of those papers marked "Failed." There would be no object in quoting the worst papers, since the authors of these will in the near future no longer be accepted as pupil nurses. In the case of No. 17 the nurse subsequently succeeded in writing a fairly creditable paper.

These papers serve to indicate in a general way what is meant by the terms ninety-seven per cent., eighty per cent., or fifty-nine per cent., and this knowledge is, of course, necessary if the following table is to be of any value whatever.

Standing in final examinations in anatomy and physiology:

Pupils who have made over 90 per cent.....	23
Pupils who have made 80–90 per cent.....	31
Pupils who have made 60–80 per cent.....	39
Pupils who have made less than 60 per cent.....	16
Total number of pupils.....	109

These figures answer the question whether probationers are capable of profiting by such a course of instruction as has been described above. The demonstration has been a long one, but the results are absolutely conclusive.

The second question, whether the gain to the nurses is worth the time and money expended, presents more difficulty. It is true that the nurse acquires a knowledge of anatomy and physiology and experiences the mental training which a study of these subjects may be made to afford, but it is not easy to prove that nurses ought to receive one hundred dollars, or five hundred dollars, or one thousand dollars' worth of knowledge and intellectual training in this or in any other way.

There are some persons, even in the nursing profession, who regard as superfluous any effort to inculcate into the pupil nurses the fundamental principles of physiology and the important facts of anatomy. There are other persons, often members of the medical profession, who regard the training of the mind as entirely superfluous as far as nurses are concerned.

I cannot prove that such opinions are wrong. I can merely state a few generalities and leave the reader to draw her own conclusions. First let me call to mind that subjects once deemed superfluous are now

regularly taught in many of our professional schools or in schools preparatory thereto. Be it for the training or for the information afforded, we find that laboratory courses in bacteriology are given to would-be housewives, that such knowledge as that of the structure of crabs and star-fish is deemed necessary for admission into some of our medical schools, that courses designed to fit men for the study of law contain such subjects as experimental physics, while the would-be journalist directs his attention for a time to the history of Chaldea or the properties of the alkali metals.

If it be true, as I think Huxley has somewhere affirmed, that science is organized common-sense, then it is hard to see how the nurse can have too much of it or of its methods. History teaches us that in all occupations the demand for education has been increasing ever since "we sprang from our ancestral tree," and it seems improbable that the nursing profession should be unique in this respect. The average probationer (perhaps one might even say pupil nurse) lacks clearness of thought and expression. Her mind is quite untrained, she is unreasoning and unoriginal. The fact (which I have heard urged) that it is impossible to make philosophers out of probationers does not shake our belief that if we can cultivate in our pupils the powers of reasoning and of observation and can stimulate inquiry, the object is a worthy one.

Thus the second question leads only to an expression of opinion, an opinion which is as worthless as any other opinion to one who has taken to heart the warning, "Don't think, experiment."

SUMMARY.

As a concluding summary it may be said that in the foregoing article we have described the course of instruction in physiology and anatomy which is being given in the Johns Hopkins Training-School for Nurses; we have shown that the probationers at this institution are capable of profiting to a considerable extent by such a course; and, finally, we have ventured to express the view that the knowledge and training which such or similar science courses can be made to afford is of considerable value to them as members of the profession which they have chosen for their own.